Caribbean- Western Atlantic Tsunami Threat Assessment

WMO RA-IV Hurricane Committee

San Juan, Puerto Rico, 04/01/06

Bill Proenza, Director
National Weather Service Southern Region
Fort Worth, Texas, USA

NWS Southern Region

Overview

- "El Peligro Olvidado" – i.e. “The Forgotten Danger”….An appropriate Spanish nickname for a deadly phenomena with a disarming low frequency.
- The catastrophic Indian Ocean Tsunami of December 26, 2004 tsunami leaves us the lesson: there is an enormous potential for loss of life in the Caribbean basin which, like the Indian Ocean, has experienced tremendous coastal population growth and explosive tourism increases because of climate and warm water attraction.
- Any Caribbean assessment of risk, although based on low frequency yields catastrophic loss of life when coupled with today’s high numbers of vulnerable coastal/beach residents and tourists.

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Caribbean & Atlantic East Coast Tsunami Fatalities in last 165 Years

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Date	Place	Fatalities
1842	Haiti	~5000
1853	Venezuela	600-4,000
1867	Virgin Islands	23
1882	Panama	75-100
1906	Jamaica	500
1918	Puerto Rico	140
1929	Canada	28
1946	Dominican Republic	1,790
1946	Dominican Republic	75
TOTAL*		**8231 to 11656**

Statistics from ***Caribbean Tsunamis, A 500-Year History from 1498-1998***
by Karen Fay O'Loughlin and James F. Lander (ISBN 1-4020-1717-0 2003 edition)

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Western Atlantic/Caribbean Tsunamis

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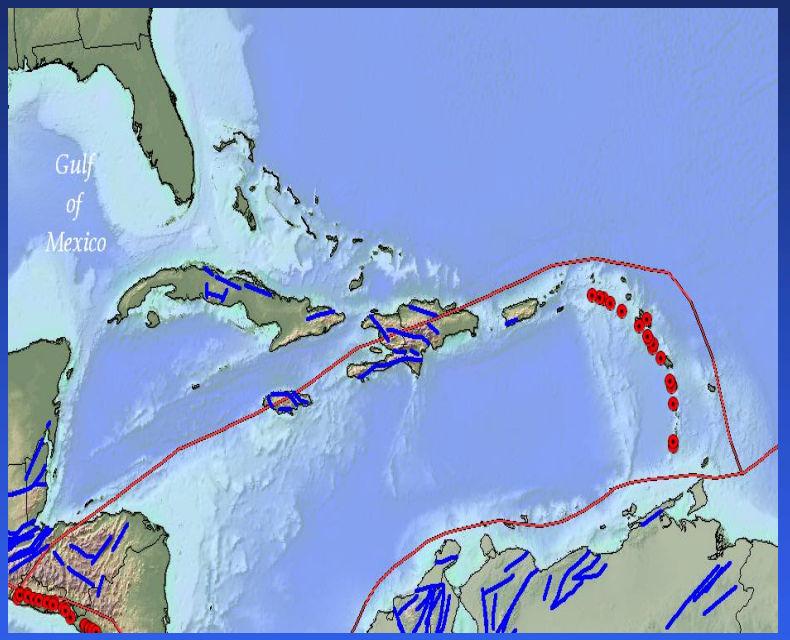
- More lives have been lost in the Caribbean due to drowning from tsunamis than from hurricane storm surge in the last 150 years.
- More than 25%* of the earth's total tsunami events occur in our Atlantic Basin.
- The Caribbean is geologically active and since the last major tsunami loss of life (1946: 1865 lives lost*) there has been major population shifts to Caribbean coasts and an explosion of tourism significantly adding risk.
- At least 8200 lives lost* in the Caribbean from tsunamis in the last 165 years.



Volcano locations, Fault lines, and plate boundaries in the Caribbean

*Statistics from ***Caribbean Tsunamis, A 500-Year History from 1498-1998*** by Karen Fay O'Loughlin and James F. Lander (ISBN 1-4020-1717-0 2003 edition)

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Tsunami Deaths Since 1842 and Geographic Areas: North-American western Coastline out to include Hawaii vs Caribbean including Puerto Rico & US Virgin Islands

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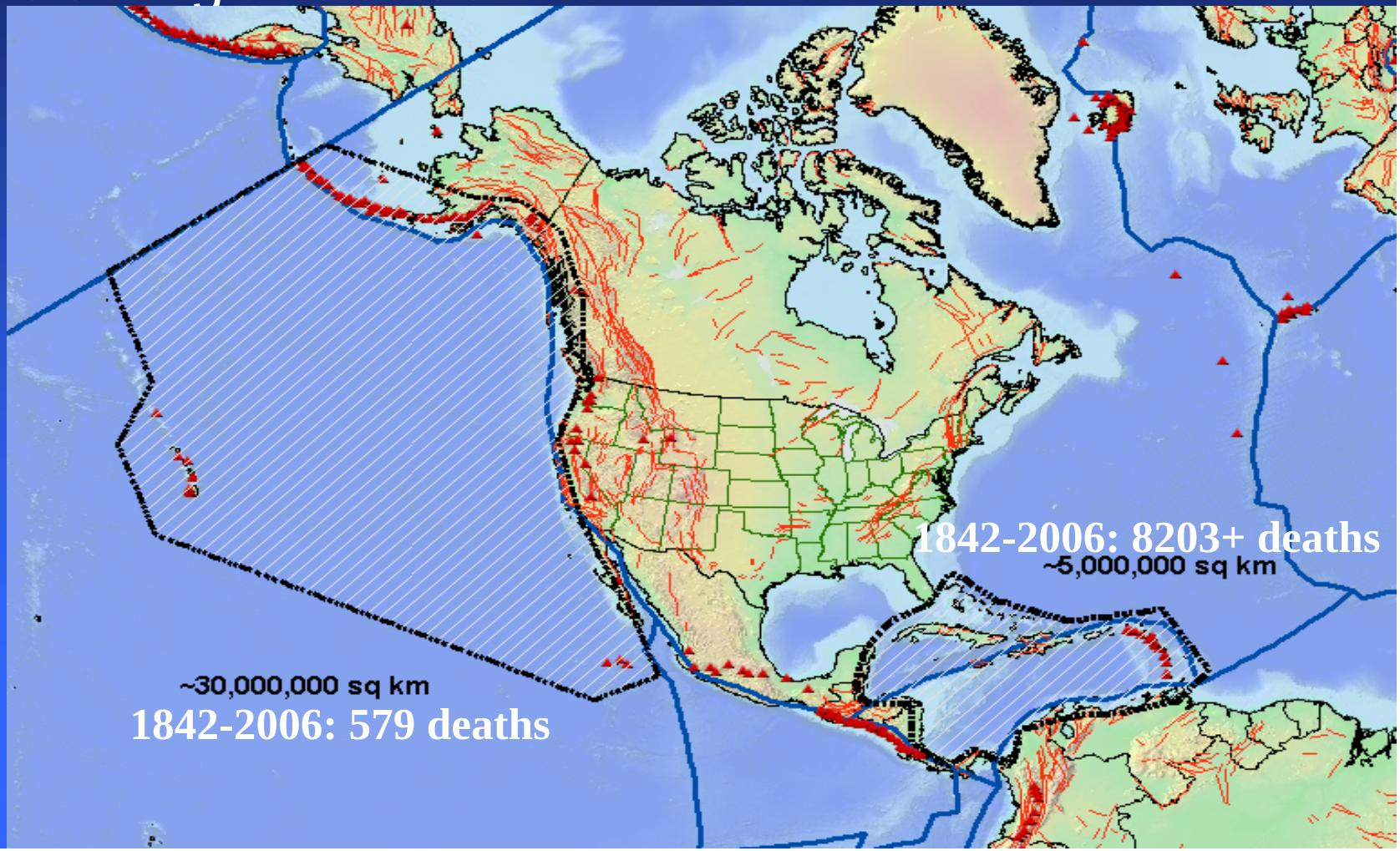
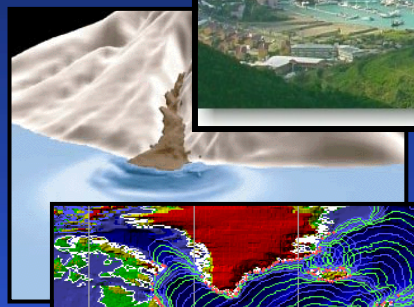
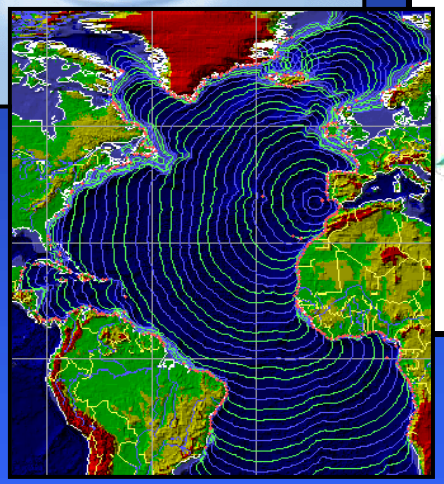
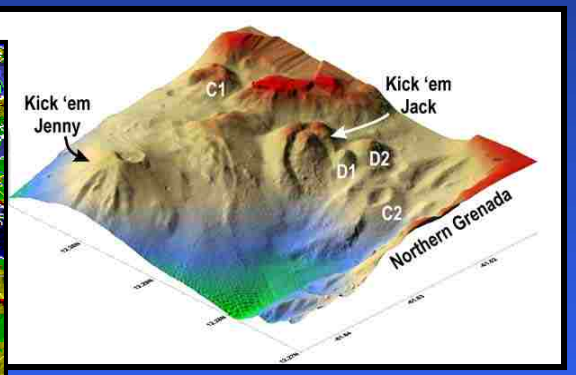


Caribbean Tsunami-genic Events are largely short-fused

- Earthquakes (multiple subduction areas/faults exist in the Caribbean)
- Landslides (both above and below water includes shelfs and trenches)
- Submarine Volcanos
- Tele-tsunami (e.g. “Lisbon” Nov. 1, 1755)







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Major 3 + Meter *Tele*-Tsunami

Risk to Life at beaches within 1 M above high water	Freq	Beach Water Temp °F	Est'd Daily Beach Attendance	Impact with a 10% Loss of Life	GAO's Draft: Risk to Life	Prelim Est. of Risk to Life
Caribbean Region (last event 1755) (*3)	1/250 yrs (*3)	Warm (80+°F) (*1)	1000K (*4)	100K per event or 40K per century	Low	Very High (25K or more per century)
3 West Coast States (last event 1964) (*2)	1/100 yrs (*2)	Cold (65°F) (*1)	20K (*4)	2K per century	High	High (1K or more per century)

Results Estimate Caribbean Beaches have *20 times higher* potential for a tele-tsunami loss of life.

Major 3 + Meter Tsunami

Risk to Life at beaches within 1 M of high water	Freq.	Beach Water Temp °F	Est'd Daily Beach Atten-dance	Impact with a 10% Loss of Life	GAO's Draft: Risk to Life	Prelim Est. Risk to Loss of Life
Caribbean Rgn Nations population 64,500K with + 100,000K visits (*4)	2/100 yrs (*3)	Warm (80+°F) (*1)	1,000k (*4)	200K per century	Low	Very High (25K or more per century)
State of Hawaii population 1,265K with 63,240K visits (*4)	2/100 yrs (*2)	Warm (80°F) (*1)	100k (*4)	10K per event or 20K per century	High	High (1K or more per century)

Results estimate the Caribbean beaches have a *10 times higher* potential for local tsunami loss of life per century.

Other sources of data and footnotes.

- *1 – NOAA Sea Surface Temperatures.
- *2 - NOAA National Geophysical Data Center.
- *3 - Landers, Lockridge, Whiteside, O’Loughlin.
- *4 - The populations and tourism numbers were taken from state government or tourism sources within Alaska, Florida, Hawaii. The Caribbean numbers were taken from the internet.

Miscellaneous sources of data and footnotes.

- Like the Indian Ocean, the warm ocean temperatures of the Caribbean are a strong attraction to residents and tourists for on the beach recreation.
- Beaches with flat low-lying topography maximize beach attendance while offering minimal opportunity to climb up to escape a tsunami. This landscape feature is found much more prevalently in the Eastern and Southern coastal areas and Caribbean than in the US western coastal States (includes Alaska).

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Questions or Comments?

Bill Proenza, Director
National Weather Service– Southern Region
Fort Worth, Texas

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